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The Barriers to Research and Innovation in Disaster Resilience in Higher Education Institutions in Asia

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Abstract

This paper reports the findings of a research study investigating the barriers to Research and Innovation (R&I) in Disaster Resilience (DR) in Higher Education Institutions (HEIs) in Asia. The scope of the study is limited to three Asian countries, i.e. Bangladesh, Sri Lanka and Thailand, due to their role in the international collaboration entitled ASCENT (Advancing Skills Creation to Enhance Transformation), which contributes to the development of research capacity building in disaster resilience ensuring sustainable and inclusive socio-economic growth in these Partner Country HEIs. Responses received from 213 semi-structured interviews and 530 survey questionnaires are used to examine and prioritize the aforementioned barriers in R&I in HEIs in Asia. Findings reveal, amongst others, that there is a crucial need for R&I skills enhancement through implementation of clear and adequate policies. Having a strong policy support, in turn, could play an important role in providing incentives to staff (academic and research staff), increasing awareness on R&I initiatives, and motivation to carry out R&I activities. Lack of training and development on R&I was surprisingly one of the lowest ranked barriers from the survey analysis, although it was the most frequently mentioned barrier during the interviews. Although this is a mixed result, training and development should be considered a priority for promoting and improving R&I in HEIs as such initiatives could help overcome many other barriers such as lack of staff R&I skills, motivation, awareness, and lack of research related performance.

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1. Research and Innovation in Disaster Resilience in Higher Education Institutions in Asia

Higher Education Institutions (HEIs), by definition, are any public or private colleges, universities, training or technical institutes that offers a prescribed course of higher education learning and offers an award in the end [1]. HEIs play an innovative role in knowledge-based societies and maximize "capitalization of knowledge" by establishing direct links and close integration with the industrial world [2]. As a result, HEIs' performance in Research and Innovation (R&I) is being viewed as critical to the growth in knowledge-based and intellectual assets, including potential for increasing international competitiveness and individual opportunities. This includes reforming and reinforcing the transformation of education ecosystems needed for the fourth industrial revolution [3].

Research is an important aspect and a core function for HEIs. The quality of research outputs and research programs not only determine the ability to teach and the quality of teaching in HEIs, but also their ability to deliver skills and research for productivity and innovation [4]. Alternatively, poor quality of research can hardly contribute to any active engagement, mentoring or value creation HEIs performance [5]. Evidence substantiate that research can enhance HEIs reputation, contribute to knowledge development, and introduce innovation to solve real world problems, eventually resulting into research capacity enhancement and research infrastructure development. Despite everything, research capacity development in HEIs is continuously declining and it remains an issue of concern to HEIs [4].

An equally significant aspect for HEIs is innovation. Innovation is the formation of new ideas or the necessity to respond to change in order to add more value to the societal contribution of HEIs [6]. Innovation occurs at various levels, including product innovation, process innovation, marketing innovation and organizational innovation. These are inevitably important to any country as these contribute to competitiveness and economic diversification in emerging economies [7]. Europe has been able to technically advance towards a low-carbon economy due to the innovations carried out in the climate-change mitigation technologies [8]. In contrast, developing countries are having difficulties in ensuring the diffusion of these technologies. Thus, there is a need to enhance their capacity in innovation.

The knowledge divide is deep and heavily tilted in the favour of developed countries. Developing countries suffer from a lack of resources - both financial and human resources in research and development. Therefore, these countries need to improve their capacity to produce knowledge domestically and absorb the knowledge produced elsewhere [9]. Building capacities in R&I in the HEIs in Asia to support Disaster Resilience (DR) Research in particular are specifically needed due to the fact that Asia is continuously facing risk of vulnerability in terms of the fast-changing conditions of human-environment systems and increasing natural disasters, accompanied by huge losses to human lives. [10]. It is increasingly recognised in policy fora that an increasing risk of disasters will undermine socio-economic development gains and, in reverse, low levels of socio-economic development increases disaster risk [11].

This paper is based on a project called ASCENT (Advancing Skills Creation to Enhance Transformation). ASCENT is an Erasmus+ programme aimed to addressing R&I capacity strengthening for the development of societal resilience to disasters. The programme is a collaboration between EU and three Asian countries to strengthen the ability of the Asian partner HEIs (03 from Bangladesh; 03 from Sri Lanka; and 02 from Thailand) to respond to their research needs in DR. Therefore, the scope of the project/paper is limited to three Asian countries, due to their role in the project. These three countries are involved in the project due to their strategic situations as discussed here:

Across these three countries, Bangladesh is widely recognized to be one of the most climate vulnerable countries in the world. Every year, Bangladesh faces many natural disasters such as droughts, floods, water-logging, cyclones and tidal surges, tornados, thunderstorms, river/coastal erosion, landslides, salinity intrusions, and other extreme weather events. Asia Pacific Disaster Report 2015 (UN-ESCAP) has shown Bangladesh as one of the most vulnerable among 15 countries with high exposure to disaster risks [12]. Sri Lanka, being a small island in the Indian Ocean in the path of two monsoons, is mostly affected by weather related hazards. Floods and droughts are the most common hazards experienced in Sri Lanka. Sri Lanka is also prone to hazards such as landslides, lightning strikes, coastal erosion, epidemics and effects of environmental pollution. In 2004, almost two-thirds of the Sri Lankan coast was affected by the Indian Ocean tsunami highlighting the country's vulnerability to low-frequency but high impact events.

In the last few decades, Thailand too has faced a number of major natural disasters, including the 2004 Indian Ocean tsunami, the 2011 floods, and the 2015-16 droughts, irregular rainfall patterns, decreased agricultural and fishery yields and rising sea-levels. The impact of disaster variability and extreme natural hazard results in not only loss of human lives, but also damage to infrastructure, disruption of livelihoods and loss of economic activities. It has, therefore, become important to remain at the competitive edge of DR to deal with these disasters and to minimize the associated losses [13].

HEIs across Asia are faced with problems such as improper utilization of available finance resources, and maintaining and improving of quality of education. The importance and complexity in research with the increasing enrolment in HEIs across Asia has made R&I more compounded [14]. Equally, that the action-research in the field of DR is also facing challenges. Among these many challenges, the theoretical research findings are not of the satisfactory quality due to barriers to R&I in DR. Even if there are theoretical research findings, these are not converted into concrete actions. [15]. Of central concern, therefore, is to enhance R&I in DR in HEIs in Asia, and to maintain and improve the quality of education across Asia. This requires identifying and addressing barriers hindering the R&I activities in DR in the partner HEIs of the ASCENT project, coupled with supporting and training researchers to set foundation of high quality research future. Hence, capacity strengthening is of paramount importance.

Given, the current high-profile debate with regard to R&I that it is becoming a global interconnecting pillar for development of multi-polar world (Amanatidou, et al., 2016), it is quite surprising that reservations remain in R&I. R&I continues to remain a scarce resource, which is in fact needed for the development of expertise in knowledge development [17]. It is a high priority that HEIs should be taking the lead for R&I to be successful [18]. Consequently, the barriers that hinder R&I activities in DR in HEIs need to be identified and addressed. It is however, important to note the limitations of research capacity-building for improving DR research in Asian contexts. The empirical evidence on what works and what does not work in research capacity-building, and to what extent the capacity exists at the HEIs level, is still fragmented.

No models or mechanisms have emerged as the most effective at supporting research capacity development. Success is highly context dependent, and this has contributed to a lack of systematic evidence around the approaches used. Existing literature on DR research capacity-building tends to discuss policy-relevant issues at a relatively high-level with less insight into the nuances of implementing research capacity-building models in every-day practice, or potential solutions to capacity-building challenges that exist at HEIs. For example, evidences confirm that the barriers to R&I in DR activities are due to lack of awareness, lack of effective information, lack of adequate coping mechanisms and appropriate expertise in DR [19]. In this context, this paper helps to address this gap through an analysis and identification of the barriers to R&I in DR in HEIs in Asia, thereby highlighting the need to understand the country specific context, and existing capacity and constraints from the start to allow for sustainable long-term improvement.

2. Methodology

As mentioned above, this paper is based on the results of a recently completed research of the ASCENT project. The purpose of the aforementioned activity was to investigate barriers that hinder the R&I activities in general within the three target Asian countries and also, in specific, within the 08 partner HEIs involved in the project. This was to develop capacity building programmes for the selected HEIs as part of the ASCENT project. Equally important, steps can be taken accordingly to overcome some of the identified barriers through these programmes and make the programmes as effective as they can be.

A mixed methodology (see Figure 1) was used not only to investigate what the barriers are in the selected countries and HEIs, but also to prioritise the critical barriers that needs addressing first. The research started with a literature review. However, an exploratory approach using qualitative methodology was then carried out due to the lack of studies/literature in the area of barriers in R&I in DR in Asia. Altogether, 213 qualitative semi-structured interviews were conducted at both national and institutional level. At national level, policy makers who are involved in DR activities and directors/managers from higher education authorities (e.g. University Grants Commission in Sri Lanka) who are responsible for policy making in R&I within HEIs were chosen as the selected participants. At institutional level, management who are responsible for taking key policy actions to promote R&I, and academic staff and research

staff who are responsible for executing R&I activities were chosen for the interviews. The interviews were carried out by the local project partners in respective countries. Thus, in order to maintain consistency with regard to data collection, a comprehensive interview guideline with detailed set of questions for each participant category (many of the questions were similar, with some deviations according to the participant category) were provided to the local partners. Face-to-face interviews were conducted with all the participants. The collected data were transcribed and analysed using a manual content analysis method. This led to a well-designed matrix, facilitating a detailed coding and categorization process. The importance of a barrier from the participants' perspective was determined observing its frequency of use by participants [20]. The next step was to conduct a questionnaire survey in order to examine the most critical barriers that are hindering the staff's R&I activities from the data emerged from both the literature review and the interviews. After a pilot study, the list of barriers was sent to the academic and research staff within the 08 institutions via Survey Monkey online platform. On the whole, 530 responses were received at the end of the survey from the staff. Other than a preliminary descriptive analysis, the survey data was mainly analyzed using exploratory factor analysis, especially Principal Component Analysis (PCA) using Statistical Package for Social Sciences (SPSS) version 23.0, to prioritize and categorize the critical barriers. The findings merged from these approaches are given in the following sections.

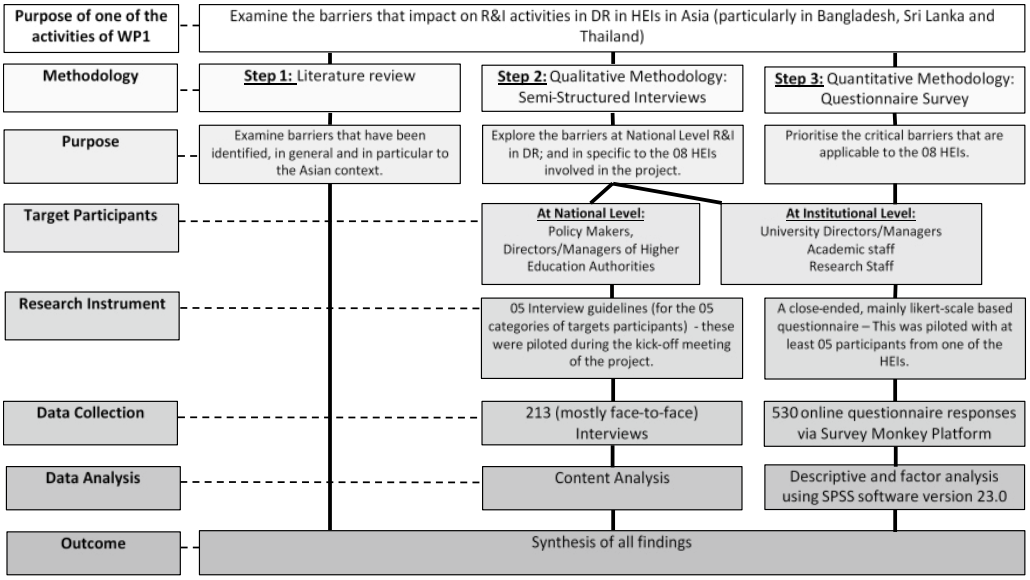

Figure 1: Methodology adopted for the research

3. Interview Findings

The barriers identified from the interviews were coded and categorized into five main sections during the content analysis process. These are: human resources, funding, policy, infrastructure and cross-cutting. The results are presented in Table 1 below. The findings present not only the list of barriers but also the number of interviewees (out of the 213) who have mentioned the relevant barrier/s. Altogether 31 barriers were identified from the interview, and it is apparent that, on average, only about 02 barriers were mentioned per interviewee (total frequency divided by the total number of interviewees). This is surprising given that there is, comparatively, low level of R&I activities within the respective countries and HEIs.

The results given in Table 1 are ranked according to the total frequencies. The findings reveal that nearly half (15) of all the 31 barriers, 04 of the top 10 barriers, and 07 of the top 15 barriers belong to the human resource category. Thus, staff related barriers such as lack of training, motivation, awareness, skills and heavy workload may be hindering the R&I process more than any other issues within the HEIs. The upside herein is that these are issues that can be resolved easily through initiatives such as training and development, which is ASCENT project's one of the main

objectives. Training and development can address problems relating to skills, motivation, networking and integration, peer mentoring and support, and research related performance. Findings also reveal that, 02 of the top 03 barriers to R&I relate to funding issues; and unclear and inadequate policies on R&I belong to one of the top 03 barriers as well. These barriers cannot be addressed at institutional level alone, thus, actions on funding and policy initiatives need to be taken jointly by the government and the university authorities at national level. One of the other notable findings e is that, of the 05 categories, six barriers relating to cross-cutting issues are lowly ranked compared to all other categories, suggesting that, overall, it may the least important of all categories.

Table 1: Barriers identified from the interviews

Categories	Barriers	Frequency (as per Interviewee Type)		Total Frequency	Rank
		Institutional	National		
Human resources	Lack of training and development on R&I	71	14	85	1
	Lack of awareness on R&I initiatives	36	11	47	5
	Lack of motivation to carry out R&I activities/Individual knowledge	23	2	25	6
	Lack of R&I skills	22	-	22	8
	Heavy teaching workload	10	3	13	11
	Lack of staff (academic and research staff)	9	-	9	13
	Lack of research networking and integration	5	-	5	15
	Lack of peer mentoring and support	2	2	4	16
	Lack of research related performance evaluation in Universities	1	2	3	17
	Lack of early career research support	2	-	2	20
	Different internal problems of Universities regarding R&I /Political problem	-	2	2	20
	Lack of skills in managing research projects	1	-	1	24
	Lack of sharing of resources	1	-	1	24
	Lack of administrative skills to support the R&I activities	-	-	1	24
	Low priority given in promotional schemes for group research work and publications	1	-	1	24
Funding	Lack of incentives to staff (academic and research staff)	59	12	71	2
	Lack of funding (budget allocation, scholarships and research grants)	53	8	61	3
	Improper use of Funds for Research /Lack of Student Loan	-	2	2	20
Policy	Unclear / Inadequate policies on R&I	54	7	61	3
	Lack of policy implementation	25	-	25	6
	Lack of up-to-date research regulations	2	-	2	20
	Lack of support for innovations & patents	1	-	1	24
Infrastructure	Inadequate infrastructure to carry out R&I activities	20	-	20	9
	Lack of technology dissemination arms /Lack of facilities	-	10	10	12
	Lack of resources (e.g. research tools, laboratories, equipment)	3	-	3	17
Cross-cutting	Bureaucracy	14	-	14	10
	Lack of multi-disciplinary team approach	-	9	9	13
	Lack of Collaboration among Ministries /university and government agency	-	3	3	17
	Lack of Commitment and Dedication among Young Researchers	-	1	1	24
	Declined Quality of Education	-	1	1	24
	Lack of Corporate and Social Initiatives	-	1	1	24
Total Frequency				506	

4. Questionnaire Survey Findings

As mentioned in Section 2, five hundred thirty (530) responses were received from the questionnaire survey. The objective of the questionnaire was to examine the critical barriers from the respondents' perspective. A 5-point Likert scale was used to assess the level of agreement. Altogether, 40 barriers were compiled for this question taken from

both the literature review and interview findings. The responses were analysed using factor analysis (see Table 2). There are two main techniques for factor analysis: common factor analysis (CFA) and Principal Component Analysis (PCA) [21]. PCA is useful when the purpose of analysis is data reduction, i.e. combining many variables under a few number of common components. Further, factor analysis assumes that any two variables are correlated through a common variable, which is called a common or hidden factor [22].

Table 2: Barriers identified from the survey

Categories	Barriers	Factor Loadings							Rank
Human Resources	Lack of R&I skills	0.800							2
	Lack of skills in managing research projects	0.641							12
	Lack of peer mentoring and support	0.600							14
	Lack of research networking and integration	0.568							17
	Lack of training and development on R&I	0.536							20
	Lack of motivation to carry out R&I activities	0.531							21
	Lack of early career research support	0.510							22
Policy	Lack of up-to-date research regulations		0.751						5
	Lack of policy implementation		0.747						6
	Unclear / inadequate policies on R&I		0.698						10
	Lack of strategic cross-cutting research initiatives to promote fundamental and interdisciplinary activities		0.558						18
Funding	Low success rate of research bidding			0.769					3
	Low pay and under-resourcing push many academics into consultancy and private teaching arrangements, rather than research			0.732					8
	Lack of incentives to staff (academic and research staff)			0.611					13
	Lack of funding (budget allocation, scholarships and research grants)			0.543					19
Infrastructure	Lack of resources (e.g. research tools, laboratories, equipment)				-0.763				25
	Inadequate infrastructure to carry out R&I activities				-0.756				24
	Lack of research space				-0.590				23
Cross-cutting	Lack of industry links					0.766			4
	Lack of opportunities for international collaboration					0.740			7
	Lack of transparency, rigour and efficiency of research governance					0.665			11
	Lack of multi-disciplinary team approach					0.590			15
Human Resources	Growing number of students increases the teaching and administration workload with less space for research						0.814		1
	Heavy teaching workload						0.702		9
	Individual research fellowship and training often do not translate into career support and organizational support of a research culture						0.588		16
	Lack of support from the administrative staff							-0.833	27
	Lack of administrative skills to support the R&I activities							-0.798	26

The objective of this research was to identify hidden pattern of many variables that were strongly agreed or agreed by the respondents and not to examine the structure of the variables. Therefore, PCA was applied. When doing the PCA analysis, to maintain consistency and for ease of comparisons, the barriers were grouped according to the already identified 05 categories developed during the interview analysis. Further, the factor loadings were capped to 0.5. This was done for two reasons. One was to reduce factors with least importance from the participant's perspective. Another

was to make the pattern matrix easy to interpret. In addition, higher the factor loadings, greater is the correlation within the response (i.e. agreement between the respondents) [23]. Thus, the barriers that have factor loadings greater than 0.66 were considered as very critical; factor loadings between 0.66 and 0.5 were considered critical (i.e. important); and finally, the barriers that have factor loadings less than 0.5 (including negative factor loadings) were considered as not critical (i.e. of very less importance).

As per Table 2, human resources, policy and cross-cutting categories have a minimum of 03 'very critical' barriers each; and funding category also has 02 'very critical' barriers. This shows that, although the top two barriers belong to the human resource category, unlike in the interview findings, overall, no one category can be considered dominant due to the dispersion of the 'very critical' barriers amongst the categories, except within the category of infrastructure. The three barriers belong to the infrastructure category are found to be not at all critical. They are also 03 of the lowest ranked barriers amongst the 27 barriers. This may mean that research space, and resources such as laboratories and equipment may not be as critically important as other issues (e.g. R&I skills) to academic and research staff in HEIs at present for conducting R&I activities. In contrast to interview findings, all 04 of the cross-cutting issues such as lack of industry links, international collaboration, transparency and governance, and multi-disciplinary team approach were within the top 15 barriers, thus, suggesting the need and urgency to address these in order to promote and improve R&I in DR in HEIs.

5. Conclusion

A synthesis of interview and survey findings, overall, reveal four barriers as the top most critical barriers, given that they were ranked highly (comparatively) in both analyses:

- Lack of R&I skills (in the human resources category; ranked 2nd in survey; 6th in interviews)
- Lack of policy implementation (in the policy category; ranked 6th in survey; 5th in interviews)
- Unclear/inadequate policies on R&I (in the policy category; ranked 10th in survey; 3rd in interviews)
- Heavy teaching workload (human resources category; ranked 9th in survey; 7th in interviews)

The above findings, *inter alia*, reveal that there is a crucial need for R&I skills enhancement through implementation of clear and adequate policies as mentioned by Olsson and Meek (2013). Having a strong policy support, in turn, could play an important role in providing incentives to staff (academic and research staff), increasing awareness on R&I initiatives, and motivation to carry out R&I activities. However, as mentioned earlier, 'policy' barrier cannot be addressed mainly at an institutional level, as it needs to be actioned jointly by the government and the university authorities at the national level.

The top 'very critical' barrier from the survey findings, i.e. growing number of students increases the teaching and administration workload with less space for research, very closely relate to one of the four barriers mentioned above on heavy teaching workload. This further highlights the severity of the barrier. Thus, steps need to be taken by the university management to reduce the heavy burden especially on teaching staff, if R&I to be improved and promoted within the HEIs. Development of a workload model and frequent monitoring of this model could be one of the ways of recognizing and addressing the workload issue in HEIs.

Lack of training and development on R&I was surprisingly one of the lowly ranked (20 out of 27) barriers during the survey analysis. In contrast, it was the most frequently mentioned barrier during the interviews. Although this is a mixed result, training and development should be considered a critical activity within the R&I agenda in HEIs. This is because one of the main ways of overcoming lack of R&I skills, which is the top most critical barrier as per aforementioned synthesis, is through appropriate training and development. Further, there are some other critical barriers that could be addressed through training and development initiatives as well. They are, lack of skills in managing research projects; lack of peer mentoring and support; lack of research networking and integration; low success rate of research bidding; lack of industry links; lack of opportunities for international collaboration; lack of transparency, rigour and efficiency of research governance; and lack of multi-disciplinary team approach.

Incidentally, the aim of the ASCENT project is to address the above through training and development in the 08 Asian Partner HEIs. The training and development initiatives will be four-fold. First set of training will be on research methodologies to improve R&I skills. Secondly, it will be on training on supplementary skills to improve skills in managing research projects, peer mentoring and support, research bidding, and multi-disciplinary team approach. The

third and fourth sets will focus on training on international collaboration and training on university-industry partnerships in order to improve research networking and integration, international collaboration, and industry links. It is hoped that these training and development initiatives will not address problems relating to skills alone, but will address, in the long-run, issues of motivation and research related performances as well.

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